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Framing Messages on the Economic Impact of Climate Change Policies: Effects on Climate Believers and Climate Skeptics

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ABSTRACT

Citizens are increasingly polarized on climate change, making persuasive communication on the issue rarely effective. We investigated how individuals with different climate change beliefs evaluated gain- and loss-framed messages on the environmental and economic impact of a related policy. In Studies 1 & 2, we found that Italian (N = 240) and American (N = 172) participants evaluated the differently framed messages according to their initial climate change beliefs, except in the crucial case of loss-framed economic messages (i.e. stressing the financial burden of the policy), which were evaluated similarly by both climate believers and skeptics. Exposure to this frame also had a significant negative effect on support for the policy. In Study 3, the same effect was found with a nationally representative sample (N = 496) of Italian citizens. Discussion focuses on the benefits, and potential drawbacks, of communication regarding the economic consequences of climate change policies.

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In recent years, research on communication regarding climate change has shown that not all citizens are readily convinced by scientific evidence on anthropogenic global warming and climate change. Whereas most people recognize the scientific consensus on this issue (Cook et al., 2016; Poortinga et al., 2019), a small but relevant proportion of the population is reluctant to do so (Leiserowitz et al., 2010). An increasing number of studies have investigated what type of arguments are best suited to convince these so-called climate skeptics to adopt pro-environmental individual behaviors (Bain et al., 2012), and support public climate change policies. One way is to focus on the economic consequences of climate change and related policies, in addition to the purely environmental ones. The reasoning behind this approach is that, as compared to arguments based on complex climate science, the economic dimension of public policies is relatively easy to understand, and it is often perceived as compelling by citizens (Mildenberger & Leiserowitz, 2017).

In this paper we explored this approach, by testing the extent to which individuals with different beliefs on climate change were persuaded by gain-framed and loss-framed arguments regarding the environmental and economic effects of a climate change policy, namely the transition from fossil fuels to renewable energy sources. We performed two experimental studies with Italian and American participants, and a survey experiment embedded in a national electoral survey, to further check for the robustness of our findings with a large representative sample. Our aim was to provide new and relevant insight on the effects of using gain vs loss and environmental vs economic frames when appealing to citizens with different beliefs on climate change.

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Climate believers and climate skeptics

For over five decades, scientific research has accumulated evidence on the existence and anthropogenic origin of global warming and climate change (Cook et al., 2016; Oreskes, 2004), and this evidence has also found consensus and support at an institutional level (IPCC, 2014). In line with this evidence, many citizens believe in climate change and think that humans contribute to it (Leviston & Walker, 2011; Poortinga et al., 2019). At the same time, many other citizens all over the word still hold uncertain or ambivalent beliefs on the issue (Leiserowitz et al., 2010). These two groups of people have been labeled as *climate believers* and *climate skeptics* (O'Neill & Boykoff, 2010) or deniers (McCright, 2007), and considerable research has been devoted to investigating and understanding the psychological roots of their respective beliefs (see Gifford & Nilsson, 2014, for a review).

Some of the psychological factors underlying individuals' skepticism about the existence of climate change are related to the basic mechanisms through which we assess and evaluate risks. Due to the global scope and slow rate of climate change, people may experience psychological distance (Akerlof et al., 2013; Spence et al., 2011) and temporal discounting of its consequences (Hardisty & Weber, 2009; Rudman et al., 2013). Limited environmental knowledge has also been associated with climate skepticism (Tobler et al., 2012). Furthermore, since climate change has entered the political debate, citizens' climate beliefs have become aligned with political affiliation and identity (Ballew et al., 2019; Bliuc et al., 2015; Huddy, 2001). This has led to a gradual polarization in public opinion on related policies. Several studies indicate that providing data and evidence in support (or against) the existence and severity of climate change often has little persuasive effect on polarized individuals, as this information is often perceived as having persuasive intent (Nelson & Garst, 2005), or carrying the ideological insignia of a disliked outgroup (Dunlap et al., 2001; Kahan, 2015).

While the research above points to a great deal of inertia in climate beliefs, work on message framing and persuasive communication has shown that when information about climate change and related policies is presented from different perspectives, emphasizing different features, attitude change *can* indeed be possible.

Framing climate change policies

Past research (Cox, 2010; Floyd, 2015; Hulme, 2008; McDonald, 2013) on how the media and politicians frame the issue of climate change shows a prevalence of fearful framing (Boykoff, 2008; Hulme, 2008), with frequent reference to impending desertification, melting glaciers, rising sea levels, and increasingly frequent and severe hurricanes. Climate change policies are consequently framed as means to avoid such potential damages to the environment (Gifford & Comeau, 2011; Moser & Dilling, 2007; Reber & Berger, 2005). This type of framing has been deemed effective in raising awareness of the severity of climate change and its consequences, and promoting support for the proposed policies, which are often technically complex and hard to explain in detail to the general public.

Some studies have attempted to portray climate change action as not only a way to prevent unwanted environmental consequences, but also as a way of expressing one's moral (Wolsko et al., 2016) and political values (Kidwell et al., 2013). Another approach to the promotion of climate change policies through message framing has been to shift the focus of communication from the environmental to the economic consequences of those policies, both at the public (Bertolotti & Catellani, 2014, 2015; Zehr, 2009) and individual level (Bain et al., 2012). The rationale of this approach is that presenting environmental policies as an investment leading to future (economic) gain, rather than as a sacrifice to prevent future losses, might be convincing not only for those with concern for the environment, but also for those without. Specifically, climate believers are expected to gladly welcome economic benefits in addition to the environmental ones, whereas climate skeptics would see the promise of future economic gain as a reward for the effort required in the short-term.

But what happens if message framing is focused on the possible economic *loss* rather than *gain* deriving from climate change policies (DeGolia et al., 2019)? Past research has shown that individuals are motivated to avoid negative consequences more than they are motivated to seek positive ones (Tannenbaum et al., 2015; Tversky & Kahneman, 1981), thus making loss-framed messages (Kahneman & Tversky, 1979; Meyerowitz & Chaiken, 1987) more persuasive than gain-framed messages (Davis, 1995; Nisbet, 2009; Scrase & Ockwell, 2010; Van de Velde et al., 2010). Consequently, loss-framed messages on the economic impact of climate change policies might have broad appeal to climate skeptics, but also sow some doubts among climate believers. Politicians and interest groups opposing pro-environmental policies often exploit this natural tendency toward loss aversion by stressing the economic costs of these policies (Campbell & Kay, 2014; Kachi et al., 2015; Mildenberger & Leiserowitz, 2017).

Competing frames for the economic impact of environmental policies

Research on communication opposing climate change policies (Broadbent et al., 2016) has investigated the motivations behind such messaging (Farrell, 2015) and its use of partial and misleading arguments to deny the scientific consensus (Lewandowsky et al., 2017). In this type of communication, environmental and economic concerns are often pitted against each other (Jacques et al., 2008), framing the decision whether to support or not policies as a trade-off between environmental conservation and the protection of current levels of economic prosperity. Faced with such an unappealing prospect, most climate skeptics oppose climate change policies, deeming the environmental concerns as irrelevant or overstated (Whitmarsh, 2011). Climate believers' reaction to this type of argument, conversely, has been less investigated, under the assumption that they would be entrenched in their own partizan beliefs. Some research on the relationship between economic conditions and perceptions and environmental attitudes suggests, however, that the economic costs frame could persuade even environmentalists to reject policies deemed too costly. Data from international surveys such as the ESS and the WVS show that people tend to prioritize environmental issues only after a certain level of wealth is achieved (Baek, 2015). This might be the case because the need for economic security lies at a more basic level than environmental concerns (Maslow, 1954). When citizens perceive their financial security to be threatened, they are likely to focus on immediate economic matters, and ignore other issues perceived as less pressing, including protection of the environment (Carmichael & Brulle, 2016; Scruggs & Benegal, 2012). This reshuffling of priorities has been observed during periods of economic hardship or recession (Mildenberger & Leiserowitz, 2017).

Based on the above, in this paper we assumed that communication evoking scarcity and financial distress, such as framing a climate change policy message in terms of economic loss, would focus citizens' attention on this specific dimension of the issue, lowering support of the policy even among citizens who are knowledgeable and concerned about the environmental dimension (i.e. climate believers).

Overview and hypotheses

In the present research, we designed three quasi-experimental studies, in which participants evaluated a new energy policy whose environmental or economic consequences were framed in gain versus loss terms. The studies were conducted in two different national contexts, Italy (Studies 1 & 3) and the United States (Study 2).

We first tested whether gain- and loss-framed messages about the *environmental impact* of the proposed policy would be differentially evaluated by climate believers and climate skeptics, as a

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function of their prior beliefs on the issue. We therefore tested the following hypothesis (Study 1 and 2).

H1: Individuals who believe in climate change evaluate gain-framed messages on the environmental impact of a climate change policy more positively than individuals who are skeptical of climate change (H1a). Conversely, they evaluate loss-framed environmental messages more negatively than climate change skeptics (H1b).

We then tested whether gain- and loss-framed messages regarding the *economic impact* of a climate change policy would be differentially evaluated according to the receiver's belief in climate change. As discussed above, in contrast with the case of the environmental impact, a loss-framed message on the economic impact of a climate change policy might convince not only climate skeptics, but also climate believers. We therefore formulated the following hypothesis, testing it with different stimuli, different measures, and participants from different national contexts (Study 1, 2 and 3).

H2: Individuals who believe in climate change evaluate gain-framed messages on the economic impact of a climate change policy more positively than individuals who are more skeptical of climate change (H2a). Conversely, climate believers and climate skeptics do not differ in their evaluation of loss-framed messages on the economic impact of the policy (H2b).

In Studies 1 and 2 we also investigated whether exposure to gain- and loss-framed messages about the environmental and economic impact of climate change policy would influence further evaluations made by recipients, namely, support for the policy and the likelihood of voting for a political candidate endorsing or opposing it. We therefore formulated the following hypothesis.

H3: Individuals who believe in climate change support the policy more strongly than individuals who are skeptical regarding climate change after being exposed to a gain- (H3a) or a loss-framed environmental message (H3b), as well as to a gain-framed economic message (H3c), but not after being exposed to a loss-framed economic message (H3d).

This would be the case because, once again, the loss-framed economic argument would be relatively persuasive for all recipients, including those who would otherwise see it as a valuable intervention against the threat represented by climate change. Finally, regarding participants' likelihood of voting for the politician endorsing or opposing the policy, we formulated the following hypothesis.

H4: Individuals who believe in climate change are more likely than climate skeptics to vote for a politician supporting the policy with a gain-framed environmental message (H4a), and less likely than climate skeptics to vote for a politician opposing the policy with a loss-framed environmental message (H4b). Similarly, individuals who believe in climate change are more likely than climate skeptics to vote for a politician supporting the policy with a gain-framed economic message (H4c). However, the likelihood of voting for a politician opposing the policy with a loss-framed economic message would be similar for both groups (H4d).

Finally, in Study 3 we also manipulated whether the messages referred to either the national or the global scale of the economic impact of the policy. Past research suggests that stressing the local consequences of climate change may attract citizens' attention on the issue, and boost their support for related policies (Brügger et al., 2015; Spence & Pidgeon, 2010). As an additional research question, we therefore investigate whether the stronger effects associated with the local consequences of the policy would extend to the economic dimension of said policies.

Study 1

In Study 1 we investigated the effects of messages describing the impact of an environmental policy (namely, the transition to renewable energy sources), framed in terms of environmental vs. economic gains vs. losses. We also measured participants' initial beliefs on the existence and origin of climate change, in order to analyze the moderating effect of climate change beliefs on message persuasiveness.

Participants and procedure

Participants were 240 Italian volunteers (58.3% women, ranging between 19 and 78 years old, M = 37.7, SD = 14.4) who were contacted through email and social media and asked to complete an online survey.

After being briefed on the purpose of the experiment, participants were asked to imagine living in a country where the Parliament was currently discussing a national energy policy, and read a 1page long scenario, presented as an excerpt from a news interview. The substance of the energy policy was summarized by a fictional journalist who then asked an unnamed politician for his/her stance on the policy. The politician's response was manipulated according to the *gain vs. loss frame* of the impact of the policy (e.g. "we should consider the future benefits that we will derive from the adoption of these policies" vs. "we should consider the future costs that we will suffer from the adoption of these policies"), and to the *economic vs. environmental content* of the politicians' arguments (e.g.: "we will suffer great economic, employment and technological losses", vs. "we will suffer great losses to the environment, wildlife, and scenic landscapes"). The full text of the manipulated interview is reported in the Appendix. Participants were randomly assigned to one of the four resulting conditions, and responded to a series of questions after reading the stimulus text.

Measures

Evaluation of the politician's statement

Participants rated their evaluation of the politician's statement using four items asking to what extent the statement was clear, sincere, exhaustive, and relevant. Scores were collected on a 7-point scale ranging from 1 ("Not at all") to 7 ("Very"), and then averaged into a single message evaluation index, which showed good reliability (Cronbach's $\alpha = .851$).

Voting probability

Participants were asked to indicate how likely they would be to vote for the interviewed politicians with a single question, "Now, please imagine that elections are held in this imaginary country. How likely is it that you vote for the politician?". A similar 7-point scale was used.

Support for the proposed policy

Participants' support for the policy described in the interview was measured using three items, "To what extent do you agree with these measures?", on a 7-point scale ranging from 1 (completely disagree) to 7 (completely agree); "Which level of priority in the government agenda would you give to these measures?", on a 7-point scale ranging from 1 (low priority) to 7 (high priority); and "What percentage of the national budget would you devote to these measures?", on a 7-point scale ranging from 1 (less than 1%) to 7 (more than 10%), with 2% spans in the intermediate response options (e.g. 1-2%, 3-4%, etc.). The three scores were averaged into a single policy support index, with adequate reliability (Cronbach's $\alpha = .671$).

Climate change belief

Participants' beliefs regarding climate change were measured using two items commonly used in research on the issue (ESS, 2016): "As far as you know, do you personally think that the world's climate is changing?", on a 7-point scale ranging from 1 ("Not at all") to 7 ("Very much"), and "Do you think that climate change is caused by natural processes or by human activity?", on a scale ranging from 1 ("Natural processes only") to 7 ("Human activity only"). The two items were moderately correlated, r(200) = .581, p < .001, and an average climate change belief index was computed.

Political orientation

Participants were asked to indicate their political orientation using a 11-point scale ranging from Left (1) to Right (7). An additional "none of the above" option was included.

Socio-demographic variables

Participants' gender, age, and education level were recorded.

Results

Antecedents of climate change belief

Consistent with past research, we found that participants' belief in climate change was associated with political orientation, r(155) = -.232, p = .004, as participants on the left of the political spectrum reported greater belief in climate change than participants on the right. Participants who declined reporting their political orientation did not significantly differ from the others, t(203) = 0.57, p = .569. Climate change belief was not significantly associated with age, r(200) = -.055, p = .439, or education, F(7, 195) = 1.07, p = .387, $\eta^2 = .04$, but was stronger among women (M = 6.07, SD = 0.95) than men (M = 5.58, SD = 1.26), t(147.24) = 2.98, p = .003.

Message evaluation

The effects of message framing, message content and climate change belief were analysed using a series of multiple regression models using the PROCESS macro (Hayes, 2018, Model 3), with message evaluation, policy support, and voting probability as dependent variables. Message framing was contrast-coded +1 for the gain condition and -1 for the loss condition, while message content was contrast-coded +1 for the economic message condition and -1 for the environmental message condition. On average the gain-framed message was evaluated more positively than the loss-framed message B = 0.52, t = 6.48, p < .001, 95% C.I. [0.36; 0.68]. A main effect of message content, B = 0.17, t = 2.14, p = .034, 95% C.I. [0.01; 0.33], was also found, indicating that messages on the economic impact of the policy were evaluated more positively than messages on the environmental impact of the policy. We found also an interaction effect between gain-loss framing and content framing, B = -0.24, t = 3.02, p = .003, 95% C.I. [-0.40; -0.08]. A follow-up ANOVA, F(1, 202) = 10.68, p = .001, $\eta^2 = .05$, revealed that the difference in the evaluation of gain- and loss-framed messages was larger in the environmental content condition (M = 4.65, SD = 1.34 vs. M = 3.01, SD = 1.34), p < .001, than in the economic content condition (M = 4.25, SD = 1.34 vs. M = 3.79, SD = 1.17), p = .081.

A main effect of climate change belief was also found, B = 0.17, t = 2.22, p = .027, 95% C.I. [0.02; 0.32], as well as interaction effects with message framing, B = 0.53, t = 7.00, p < .001, 95% C.I. [0.38; 0.68], and, to a smaller extent, message content, B = 0.15, t = 1.99, p = .048, 95% C.I. [0.00; 0.30]. A follow-up analysis on the association between climate change beliefs and message evaluation in the environmental message conditions showed that, as predicted by H1a, participants' evaluation was positively associated with their climate change belief in the case of the gain-framed message, B = 0.60, t = 4.14, p < .001, 95% C.I. [0.31; 0.89]. In the case of the loss-framed message, participants' evaluation was instead negatively associated with their climate change belief, B = -0.60, t = 3.56, p = .001, 95% C.I. [-0.93; -0.26], consistent with our H1b. In the economic message conditions, there was a strong positive association with climate change belief in the case of the gain-framed message, B = 0.77, t = 7.92, p < .001, 95% C.I. [0.57; 0.96], as predicted by H2a, but no significant effect of climate change belief in the case of the loss-framed message, B = 0.77, t = 7.92, p < .001, 95% C.I. [0.57; 0.96], as predicted by H2a, but no significant effect of climate change belief in the case of the loss-framed message, B = 0.77, t = 7.92, p < .001, 95% C.I. [0.57; 0.96], as predicted by H2a, but no significant effect of climate change belief in the case of the loss-framed message, B = -0.16, t = 0.80, p = .430, 95% C.I. [-0.55; 0.24], as predicted by our H2b (Figure 1).

Taken together, these results confirmed that gain- and loss-framed messages on the environmental impact of the policy, as well as the gain-framed message on the economic impact, were evaluated more positively or negatively depending on participants' prior beliefs on the issue of climate



Figure 1. Effects of climate change belief on participants' evaluation of the message in the four experimental conditions (Study 1).

change. This was not the case for the loss-framed message on the economic impact of the policy, which was similarly evaluated by both climate change believers and skeptics.

Policy support

A main effect of climate change belief on policy support was found, B = 0.45, t = 6.92, p < .001, 95% C.I. [0.32; 0.58], with greater support among participants with stronger climate change belief. A main effect of message framing, B = 0.27, t = 3.79, p < .001, 95% C.I. [0.13; 0.40], was also found, indicating that support was generally higher when the politician endorsed the policy with gain-framed messages than when the politician opposed it with loss-framed messages. This effect was moderated by additional interaction effects: the framing by content interaction, B = 0.15, t = 2.14, p = .034, 95% C.I. [0.01; 0.29], the framing by climate change belief interaction, B = 0.13, t = 2.00, p = .047, 95% C.I. [0.00; 0.26], and, most notably, the three-way interaction, B = 0.13, t = 2.02, p = .044, 95% C.I. [0.00; 0.26].

We tested the conditional effect of climate change belief on policy support in each experimental condition (Figure 2), finding the predicted strong and positive association in the environmental gain condition (H3a), B = 0.62, t = 5.35, p < .001, 95% C.I. [0.38; 0.85], in the environmental loss condition (H3b), B = 0.61, t = 4.50, p < .001, 95% C.I. [0.34; 0.89], and in the economic gain condition (H3c), B = 0.55, t = 6.19, p < .001, 95% C.I. [0.37; 0.73]. However, consistent with our H3d, the association was not significant in the case of the economic loss condition, B = 0.11, t = 0.06, p = .955, 95% C.I. [-0.38; 0.40]. The diverging pattern found in this case suggested that the persuasiveness of the loss-framed economic message largely counterbalanced the effect of participants' belief in climate change, keeping support for the policy low across different levels of belief.

Voting probability

We then analysed the effects of message framing, content and climate change belief on participants' self-reported likelihood of voting for the interviewed politician. Participants were, in general, more likely to vote for the politician using gain-framed messages (M = 4.73, SD = 1.74) than loss-framed messages (M = 2.87, SD = 1.71), B = 0.89, t = 8.99, p < .001, 95% C.I. [0.69; 1.09]. A main effect of climate change belief was also found, B = 0.23, t = 2.53, p = .012, 95% C.I. [0.05; 0.42], moderated



Figure 2. Effects of climate change belief on participants' support for the policy in the four experimental conditions (Study 1).

by a message framing × climate change belief interaction effect, B = 0.81, t = 8.68, p < .001, 95% C.I. [0.03; 0.40]. A significant message content × climate change belief interaction effect was also found, B = 0.22, t = 2.34, p = .021, 95% C.I. [0.04; 0.40], together with a significant three-way interaction effect, B = -0.21, t = 2.22, p = .028, 95% C.I. [-0.39; -0.02].

Follow-up separate regressions for each experimental condition showed that in the gainframed environmental message condition voting probability was positively associated with climate change belief, B = 1.00, t = 5.94, p < .001, 95% C.I. [0.70; 1.33], as predicted by H4a. In the loss-framed environmental message condition voting probability was instead negatively associated with climate change belief, B = -1.02, t = 5.25, p < .001, 95% C.I. [-1.41; -0.63], as predicted by H4b. In the gain-framed economic message conditions, consistent with H4c voting probability was positively associated with climate change belief, B = 1.03, t = 8.79.92, p < .001, 95% C.I. [0.79; 1.26]. Finally, no association with climate change belief was found in the case of the loss-framed economic message, B = -0.16, t = 0.60, p = .552, 95% C.I. [-0.70; 0.38], thus confirming our H4d.

In sum, Study 1 provided support for our hypotheses on the differential persuasiveness of lossframed economic messages as compared to gain-framed economic messages and gain- and lossframed environmental messages. The evaluation of these messages depended on climate change belief, by-and large, with the evaluation of loss-framed economic messages the lone exception. After reading these messages, both climate skeptics and climate believers showed lower support for the proposed climate change policy and higher intention to vote for the politician opposing it on economic grounds.

Study 2

In Study 2 we replicated the same design used in Study 1, testing it in a different national context, the United States. American citizens' attitudes towards the issue of climate change and the policies proposed to deal with it have been widely investigated, with some studies indicating a greater prevalence of climate skeptics (Tranter & Booth, 2015) and a stronger polarization of the public opinion on the issue (Bliuc et al., 2015), as compared to other countries.

Participants and procedure

Participants were 172 American M-Turk workers (42.7% women, ranging between 19 and 75 years old, M = 35.2, SD = 10.5), who were asked to complete the English version of the online survey described in Study 1.

Measures

The same measures of participants' evaluation of the politician's statement (Cronbach's α = .887), voting probability, support for the proposed policy (α = .819), climate change belief, *r*(161) = .678, *p* < .001, and political orientation used in Study 1 were also used in Study 2.

Results

Antecedents of climate change belief

Compared to Study 1, we found a stronger association between belief in climate change and political orientation, r(156) = -.591, p < .001, as participants who identified as liberals had much stronger belief in climate change and its anthropogenic origin than participants who identified as conservatives. We also found stronger beliefs among women (M = 5.96, SD = 1.50) than men (M = 5.46, SD = 1.58), t(162) = 2.08, p = .039, but no differences based on age, r(159) = .059, p = .455, or education, F(5,158) = 1.08, p = .373, $\eta^2 = .03$.

Message evaluation

In general, gain-framed messages were evaluated more positively (M = 5.31, SD = 1.28) than lossframed messages (M = 4.30, SD = 1.67), B = 0.48, t = 4.42, p < .001, 95% C.I. [0.26; 0.69]. The same interaction effect found in Study 1 between gain-loss framing and message content also emerged, B = -0.48, t = 4.43, p < .001, 95% C.I. [-0.69; -0.27]. A follow-up ANOVA confirmed the interaction effect, F(1, 160) = 19.44, p < .001, $\eta = .11$, showing a significant difference in the evaluation of gain- and loss-framed messages in the environmental content condition (M = 5.69, SD = 1.05 vs. M = 3.71, SD = 1.63), p < .001, but not in the economic content condition (M = 4.95, SD = 1.38 vs. M = 4.91, SD = 1.38), p = .913. The main effect of climate change belief, B = 0.13, t = 1.73, p = .084, 95% C.I. [-0.02; 0.27], and the interaction effect with message frame, B = 0.14, t = 1.87, p = .064, 95% C.I. [-0.01; 0.28] were only marginally significant, although their trends replicated those predicted by H1 and H2, and found in Study 1.

Policy support

As in Study 1, we found a main effect of climate change belief on policy support, B = 0.37, t = 6.44, p < .001, 95% C.I. [0.26; 0.48], the two-way interaction effects with message framing, B = 0.24, t = 4.15, p < .001, 95% C.I. [0.13; 0.35], and content framing, B = -0.22, t = 3.78, p < .001, 95% C.I. [-0.33; -0.10], and also the predicted three-way interaction, B = 0.22, t = 3.83, p < .001, 95% C.I. [0.11; 0.33]. We found the predicted positive association in the environmental gain condition (H3a), B = 0.61, t = 6.55, p < .001, 95% C.I. [0.42; 0.79], in the environmental loss condition (H3b), B = 0.57, t = 5.94, p < .001, 95% C.I. [0.37; 0.76], and in the economic gain condition (H3c), B = 0.61, t = 7.00, p < .001, 95% C.I. [0.43; 0.79], but not in the economic loss condition (H3d), B = -0.31, t = 1.79, p = .081, 95% C.I. [-0.66; 0.04], again as predicted.

Voting probability

As in Study 1, participants were more likely to vote for the politician using gain-framed (M = 5.37, SD = 1.56) rather than loss-framed messages (M = 2.59, SD = 1.89), B = 1.35, t = 11.39, p < .001, 95% C.I. [1.12; 1.59]. We then found a main effect of climate change belief, B = 0.29, t = 3.61, p < .001, 95% C.I. [0.13; 0.44], and a two-way interaction with message framing, B = 0.39, t = 4.97, p < .001,

95% C.I. [0.24 0.55]. We also found the predicted three-way interaction effect, B = -0.19, t = 2.51, p = .013, 95% C.I. [-0.36; -0.04]. Consistent with our H4, the likelihood of participants voting for the politician was positively associated with climate change belief in the gain-framed environmental message condition (H4a), B = 0.74, t = 6.33, p < .001, 95% C.I. [0.51; 0.98], negatively associated with it in the loss-framed environmental message condition (H4b), B = -0.44, t = 2.47, p = .018, 95% C.I. [-0.81; -0.08], and again positively associated in the gain-framed economic message condition (H4c), B = 0.61, t = 5.72, p < .001, 95% C.I. [0.40; 0.83], but no association was found in the case of the loss-framed economic message condition, B = 0.23, t = 1.05, p = .299, 95% C.I. [-0.21; 0.66], as predicted by H4d.

In sum, results of Study 2 largely replicated the results of Study 1 in the American context, again indicating that loss-framed messages on the economic impact of energy policies can have relevant effects on the evaluations and support for the policies not only of climate skeptics, but also of climate believers.

Study 3

In Study 3, we ran a survey experiment within a large representative panel survey conducted before the 2018 Italian national elections. Thanks to a more diverse and nationally representative sample of participants, we aimed at having a further, more robust test of our hypothesis on the effects of messages on the economic impact of climate change policies. In addition to gain- vs. loss framing, in this study we manipulated the national vs. global scope of such economic impact, to examine whether it moderated the impact of gain- vs. loss framing.

Participants and procedure

Participants were a subset of the ITANES 2018 electoral survey panel.¹ They completed an online questionnaire containing several questions on their political attitudes and opinions. In addition, they were randomly allocated to some survey experiments. 496 participants (54.8% were women, ranging between 20 and 83 years old, M = 46.4, SD = 13.1) were allocated to the experiment presented in this paper.

Participants read a shortened version of the scenario used in the previous studies, followed by a single statement (approximately 30 words) by the unnamed fictitious politician, highlighting the economic gains vs. losses deriving from the adoption of the proposed climate change policy. In addition to manipulating the *gain/loss framing*, in this study we also introduced a manipulation of the scope of the policy impact, setting it a national or global level (*national/global scope*). The gain-framed message read as follows: "I support the plan. If we adopt this renewable energy plan in our country [around the world] we will obtain economic benefits, promote technological development, and create new jobs in our country [around the world]." The loss-framed message, conversely, read as follows: "I oppose the plan. If we adopt this renewable energy plan in our country [around the world], we will suffer economic damages, face an expensive technological conversion, and lose jobs in our country [around the world]." Participants were randomly assigned to one of the four conditions.

Measures

Agreement with the politician's statement

Participants rated their agreement with the message on the economic impact of the policy on a 10point scale ranging from 1 ("Completely disagree") to 10 ("Completely agree").

Climate change belief

A single item measured participants' belief on the existence of climate change, based on the same measure used in Studies 1 and 2. Response options ranged from 1 ("Completely disagree") to 10 ("Completely agree").

Political orientation

Participants were asked to indicate their political orientation using a 11-point scale ranging from Left (0) to Right (10). An additional "none of the above" option was included.

Socio-demographic variables

Participants answered to questions regarding their gender (male or female), age (in years), and education level.

Results

Antecedents of climate change belief

Similar to Study 1, belief in climate change was moderately associated with left-leaning political orientation, r(331) = -.229, p < .001. No significant effects of gender, t(476) = 0.86, p = .390, age, r(484) = .021, p = .650, or education, r(484) = -.063, p = .165, were found.

Agreement with the message

We ran a multiple regression model similar to the ones tested in the previous studies. A main effect of the gain/loss frame emerged, B = 2.28, t = 20.14, p < .001, 95% C.I. [2.06; 2.51], indicating that on average the gain-framed message was evaluated more positively (M = 4.54, SD = 4.75) than the loss-framed message (M = 1.99, SD = 2.97). A main effect of climate change belief also emerged, B = 0.25, t = 4.32, p < .001, 95% C.I. [0.14; 0.37], indicating that the more participants believed in climate change the more they agreed with the politician's statement. This effect was moderated by the predicted climate change belief × gain/loss frame interaction effect, B = 0.38, t = 6.56, p < .001, 95% C.I. [0.27; 0.50]. Follow-up simple slope analyses (Figure 3) showed that agreement with the politician's



Figure 3. Effects of climate change belief on participants' agreement with gain-framed and loss-framed messages on the economic impact of the policy (Study 3).

statement was strongly and positively associated with climate change belief in the gain-framed condition, B = 0.64, t = 10.76, p < .001, 95% C.I. [0.52; 0.75], but not in the loss-framed condition, B = -0.13, t = 1.31, p = .190, 95% C.I. [-0.31; 0.63]. Once again, this finding corroborated our hypotheses H2a and H2b.

No significant effect of national/global framing, nor of its interaction with gain/loss framing and climate change belief emerged, Bs < 0.20, ts = 1.70, ps < .090, indicating that this feature of the message did not affect participants' evaluation.

In sum, the results of Study 3 provided further support for our main hypotheses regarding the persuasive effect of loss-framed messages on the economic impact of environmental policies, showing that the pattern observed in Studies 1&2 applied also when the experiment was carried out with a representative sample of the population.

General discussion

In three studies, we investigated the effects of gain- and loss-framed messages on the environmental and economic impact of a policy addressing the issue of climate change. Results showed that the evaluation of the messages depended on receivers' prior beliefs on the existence and severity of climate change, but also on the type of argument used to describe the expected consequences of the policy. Messages stressing the potential economic losses deriving from the adoption of the policy proved convincing for participants who believed in climate change, while this was not the case for messages stressing the potential environmental losses deriving from the policy implementation. Our results add to previous research on the effects of communication on the adoption of pro-environmental policies in several respects.

Past research had found that climate believers tend to approve and support policies presented as means to achieve environmental gains more than climate skeptics, and conversely, climate skeptics tend to listen more carefully than climate believers to loss-framed communication insinuating that these policies would be ineffective, or even backfire. This has been attributed to motivated processing (Taber et al., 2008), resulting in greater attention and acceptance of messages consistent with recipients' prior beliefs on the issue. Results from our studies confirmed these findings, but at the same time extended them, showing that they may not always apply to messages focused on the economic impact of the policies. We found that the prospect of economic losses dampened participants' support for the policy, even among those with strong belief in climate change belief. This might be the case because climate believers' tend to hold in great regard not only the preservation of the environment, but also other pro-social values and societal concerns (Hornsey et al., 2016; Stern et al., 1995), and therefore they might be alarmed by the economic strain imposed on the society by climate change mitigation policies. In other words, this type of message frames the policy as a difficult trade-off between environmental benefits and economic costs (Carmichael & Brulle, 2016; Scruggs & Benegal, 2012), eliciting ambivalent attitudes even among supporters. Furthermore, in Study 3 we found that participants' evaluation of the messages did not change when they highlighted the national (vs global) economic impact of the policy. This indicates that a focus on the economic dimension may neutralize the effect of this approach, which had been investigated by some studies in the past (Brügger et al., 2015).

Climate believers' heightened sensitivity to economic loss might also explain the diverging patterns we found in participants' support for the policy in the different experimental conditions. Whereas participants were in general more supportive of the policy the more they believed in climate change, those in the loss-framed economic message condition deviated from this trend. This indicates that messages describing the economic losses deriving from a proposed policy can "flatline" climate believers' support, bringing it down to a level similar to their skeptical counterparts. Such finding provides, to our knowledge, the first empirical evidence, in a quasi-experimental setting, of the effectiveness of the communication strategy often used by political campaigns contrasting climate change policies on financial and economic grounds (Campbell & Kay, 2014; Kachi et al., 2015; Mildenberger & Leiserowitz, 2017).

Our research has some limitations that may be addressed by future research. In our experimental stimuli we provided participants with a simplified version of what citizens usually experience when governmental policies are debated, showing them a short description of the policy, and an equally short statement by a generic fictional politician. The framing of the messages used in our studies was chosen to focus on opposite scenarios (environmental vs. economic gain vs. loss) in stark contrast with each other. In reality, the consequences of a proposed policy are often framed in more complex and nuanced ways, reflecting not only the positive or negative valence of the consequences, but also whether one's position is aimed at achieving or avoiding said consequences, and their relevance to different basic growth or safety concerns. Research on message framing has shown (Cesario et al., 2013) that different levels of framing (in particular non-loss and non-gain frames, in addition to the more straightforward gain and loss frames) can be used to highlight different features of a proposed behavior or policy, often with relevant persuasive effects on the audience. Some of these additional levels of message framing have been investigated also in the context of communication about climate change and energy policies (Bertolotti & Catellani, 2014, 2015). Future research might therefore explore the effectiveness of economic arguments on the impact of climate change policies framed at multiple levels. Furthermore, there are several relevant political and communication-related factors not included in our experimental design which certainly play a relevant role in citizens' deliberation on this topic, including media coverage (Carmichael et al., 2017) and its quality, the relative salience of economic and environmental issues at the time of the debate (Scruggs & Benegal, 2012), the political affiliation of the source of statements in support or against the policy (Bliuc et al., 2015; Kahan, 2015). Individual differences among citizens may also affect their attention and sensitivity to certain messages. Regulatory focus (Higgins, 1997) is a well-known moderator of framing effects in persuasive communication, including communication on energy and climate change policies (Bertolotti & Catellani, 2014; Mannetti et al., 2013).

To conclude, our results may provide some guidance to policy makers and advocacy groups aiming to increase support for public climate change policies. In particular, our findings indicate that the idea of discussing climate change policies in economic terms proposed by some previous research (Bain et al., 2012; Bertolotti & Catellani, 2014; Scrase & Ockwell, 2010) should be approached with some caution, given the potential drawback of exposing climate believer audiences to persuasive economic arguments *against* the adoption of said policies. Nevertheless, an increased understanding of these effects may help in devising new communication strategies (Van der Linden et al., 2017) to both overcome the increasing polarization of the political discourse on the issue of climate change, and effectively confront campaigns aimed at slowing down or preventing the adoption of climate change policies.

Note

1. The ITANES group has been analyzing the Italians' voting behavior since the beginning of 1990s. Readers interested in this research program should visit the website www.itanes.org. The 2018 ITANES survey was conducted prior to the March 4th Italian political election and involved a representative sample of Italian voters.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The data that support the findings of the studies are available from the corresponding author upon reasonable request.

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